

# **THE GOVERNOR'S REPORT**

## **The Potential for DROUGHT IN MONTANA**

**2012**

The Honorable Governor Brian Schweitzer

Prepared by

The Montana Drought Advisory Committee

[www.Drought.mt.gov](http://www.Drought.mt.gov)

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## EXECUTIVE SUMMARY

The *Governor's Report on the Potential for Drought 2012* provides projections of what Montanans can expect through early summer in terms of climate conditions, reservoir storage, streamflow, soil moisture, and agricultural production. At this time, the potential for drought-like conditions for surface water uses dependent on snowmelt runoff from mountain snowpack through July is **low**. The potential for impacts from drought to dryland farming and livestock production at this time is **low** west of the Continental Divide, and **low to moderate** east of the Divide into mid-July.

The May 2012 Montana Water Supply and Moisture Condition Status by County map, indicates that drought conditions are absent statewide at this time with 5 counties on the eastern tier, 4 in the south-central region, and 3 others in the Missouri Headwaters rated as *Slightly Dry*; 15 counties in the north-central region, and 2 west of the Divide are rated as *Slightly Moist*, with the rest rated at *Near Average*. See: <http://nris.mt.gov/Drought/status/>

According to the USDA's Natural Resources Conservation Service (NRCS) May 1, 2012 Montana Basin Outlook Report, "Spring snowpack is primed for runoff during the month of May. Looking forward to May, the weather will be a major driver in the timing of our spring runoff. The northern basins continue to be at or slightly above average, while the southern basins, feeling the effects of the warm temperatures, saw a decrease in basin snowpack percentages."

As of May 1, and assuming average precipitation continues, NRCS forecasts streamflow for the period of May 1 through July 31 to be around 102 percent of average west of the Continental Divide and east of the Divide 85 percent of average." Of 54 river basins shown on the May 7, 2012 Surface Water Supply Index Map, 50 are forecast to range from average to extremely wet, with only 3 basins at slightly below and 1 basin at moderately dry through May. See: <http://nris.mt.gov/NRCS/swsi/pdf/swsi201205.pdf>

For the water year October through April, the National Weather Service reports precipitation averaged 7.05 inches, or 0.68-inches above normal, and the 39<sup>th</sup> wettest of the 118 year record. From October 1, 2011 through May 3 the western division indicates precipitation amounts from 100- to 140 percent of average; the southwest ranges from about 70- to 130 percent; the central from 80- to 130 percent; the south-central from 70- to 100 percent; the northeast from 70- to 110 percent; and the southeast between 60- and 100 percent of average.

The U.S. Geological Survey reports that, as of the end of March, streamflow was below normal at two of eight long-term gaging stations; normal at four stations, and above normal at two stations. Contents were normal at four of six major hydroelectric reservoirs and above normal at two of six hydroelectric reservoirs. Contents were below normal at one of four major irrigation reservoirs and above normal at three of four irrigation reservoirs in Montana. Carryover reservoir storage from 2011's record-breaking water year has left reservoirs with average or above average contents at this time. As of April 1, Bureau of Reclamation reservoirs were above average or expected to fill.

Officials of the Northern Rockies Coordination Center (NRCC), in Missoula, report that there are no indications for anything other than a normal wildfire season at this time. It is important to remember that low streamflow, wildfire, and other impacts from dry and warm weather are not uncommon by mid- to late summer in Montana in any given year.

All May 10 meeting presentations here: <http://drought.mt.gov/Committee/Meetings.aspx>

## INTRODUCTION

Each April, the Montana Governor's Drought Advisory Committee (committee) presents a report to the Governor on the potential for drought for the coming crop year and water use season. The committee is charged with monitoring, forecasting, assessing, and reporting water supply and moisture conditions, enabling Montanans to make timely and informed decisions in managing their businesses or operations vulnerable to climate variability, and if necessary, to mitigate impacts. The committee meets monthly from April through October to provide regular water supply and moisture condition updates and projections. The committee met in March as well this year.

Preparing an outlook for the potential for drought each spring involves forecasting water supply and moisture conditions, including the water content of the mountain snowpack, reservoir storage levels, soil moisture, and streamflow. From these data, NRCS develops and releases water supply forecasts for coming months. Map products such as the Surface Water Supply Index (SWSI) provide a graphic representation of anticipated conditions. A member of the committee participates in a discussion of water supply and moisture conditions in Montana for the U.S. Drought Monitor Map issued weekly year around. See: <http://droughtmonitor.unl.edu/>

The committee's state agency members are charged with making the best use of the information reported by its monitoring member agencies in preparation for the start of the water use and growing season. Outlooks provide for the best informed management of the state's natural resources such as its fisheries, state and federal wildlife management lands, recreation areas, and other multiple use lands prone to impacts as the dry season approaches.

The potential for drought in Montana for 2012 at this time is **low** for surface water uses and **low to moderate** for non-irrigated agricultural production. The eastern tier counties are an area of concern at this time. The official Internet site of the Governor's Drought Advisory Committee can be found at: [www.drought.mt.gov](http://www.drought.mt.gov). Presentations from the meetings are posted on the site at "Drought Committee" - "Meeting Information." <http://drought.mt.gov/Committee/Meetings.aspx>

## CURRENT WATER SUPPLY AND MOISTURE CONDITIONS

### Montana Water Supply and Moisture Status by County

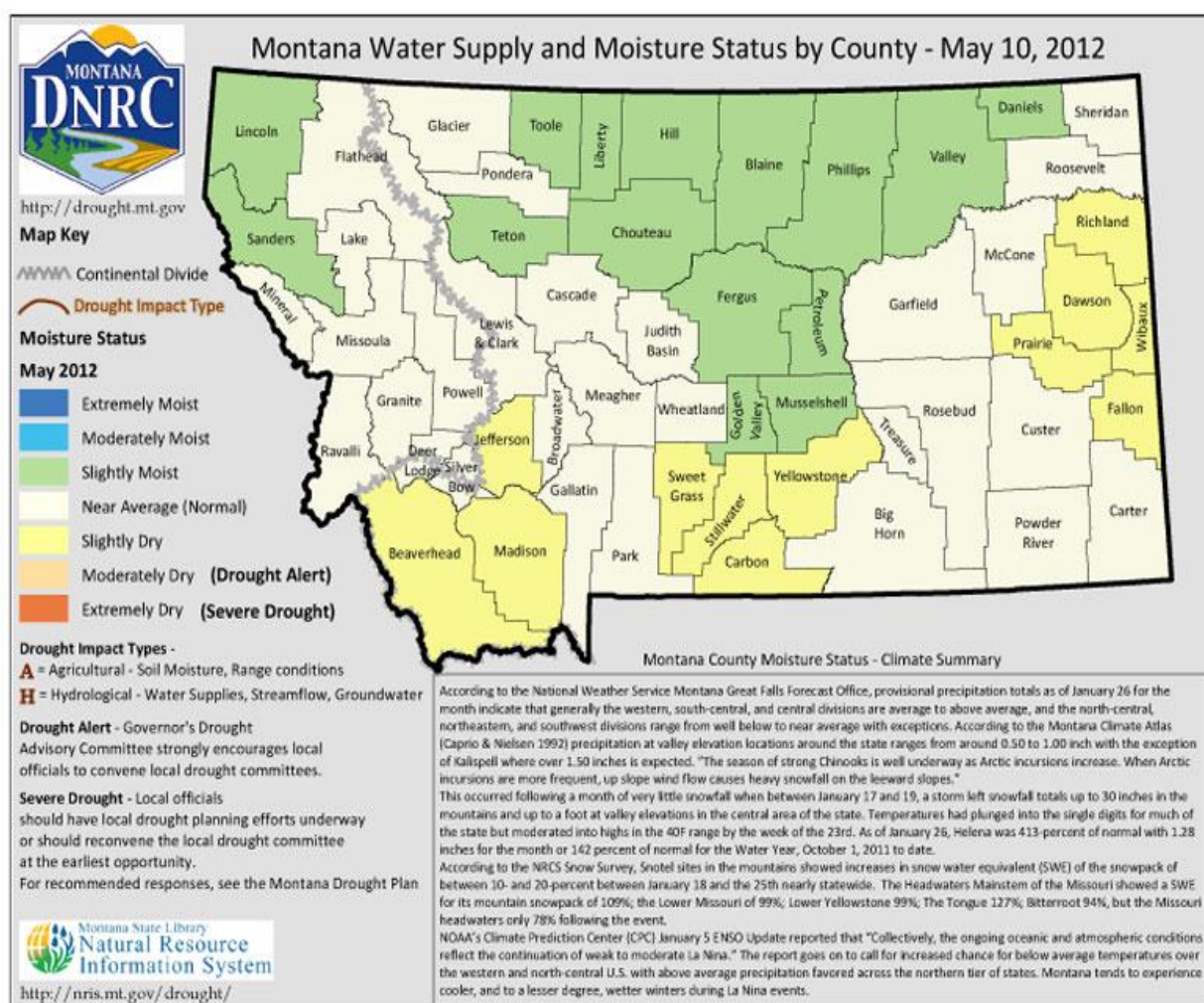
The Montana Governor's Drought Advisory Committee performs a monthly assessment of drought conditions by county on a year-around basis. A technical group of committee scientists assesses conditions for each county using a variety of moisture and water supply data from remote real-time monitoring and standard valley-elevation gauging systems, as well as field reports from county extension agents, producers, and other government field offices.

The group classifies each county in one of seven descriptive categories including *Extremely Moist*, *Moderately Moist*, *Slightly Moist*, *Near Average*, *Slightly Dry*, *Moderately Dry*, and *Extremely Dry*. The Map legend also notes that the categories, Moderately Dry and Severely Dry, correspond respectively with the "Drought Alert" and "Severe Drought" action levels used in the Montana Drought Plan. The map depicts the Continental Divide, county names and boundaries, and can delineate specific drought impact types as "A" for agricultural or "H" for hydrological drought.

The May 2012 Montana Water Supply and Moisture Condition Status by County map, indicates that drought conditions are absent statewide at this time with 5 counties on the eastern tier, 4 in the south-central region, and 3 others in the Missouri Headwaters rated as *Slightly Dry*; 15 counties in the north-central region, and 2 west of the Divide are rated as *Slightly Moist*, with the rest rated at *Near Average*.

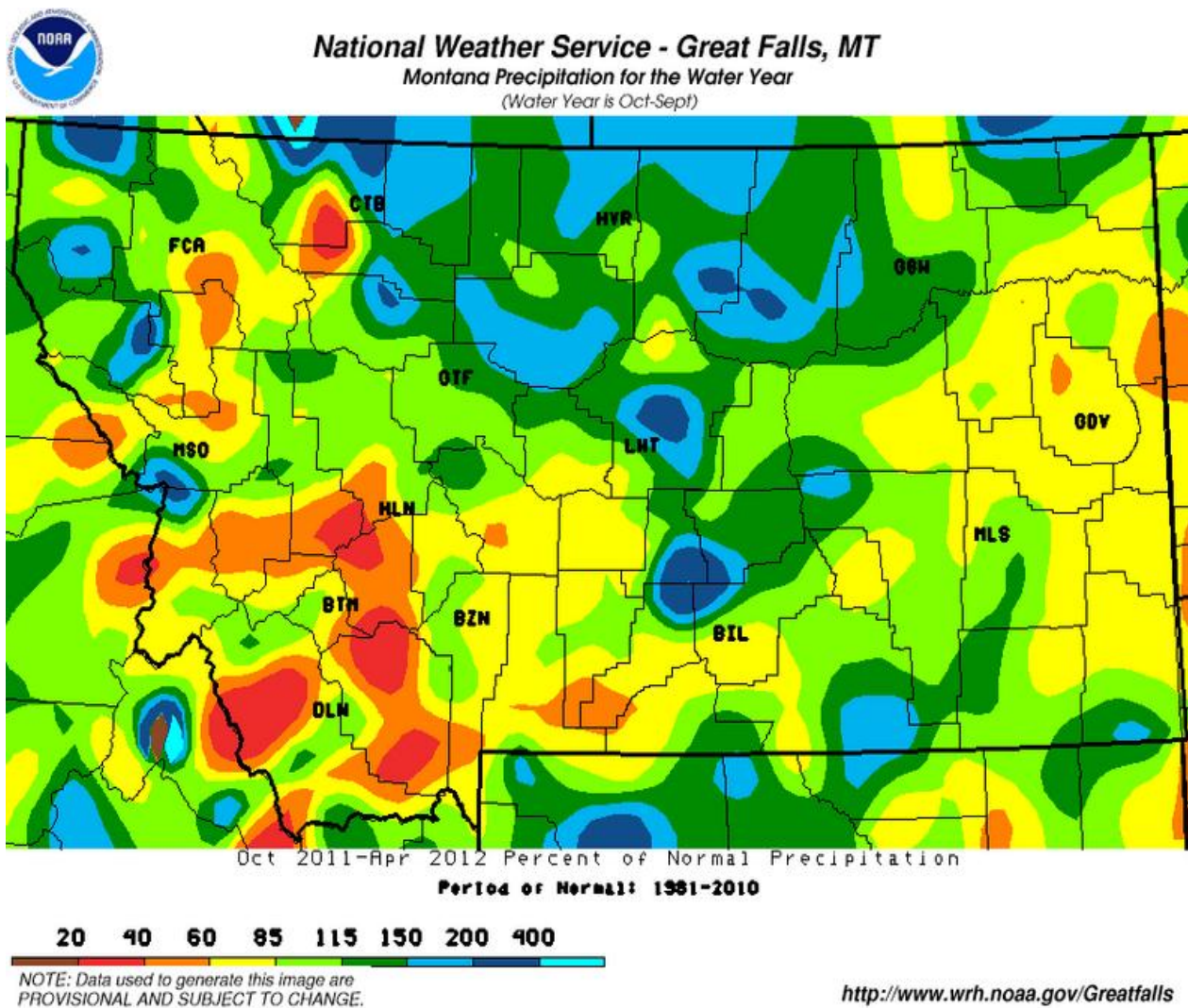
Improvement over the April map occurred in the eastern tier, and the northcentral and central regions, but some downgrading was seen in the south-central region of the state. There were no changes in status west of the Divide from April to May.

See: <http://nris.mt.gov/Drought/status/>

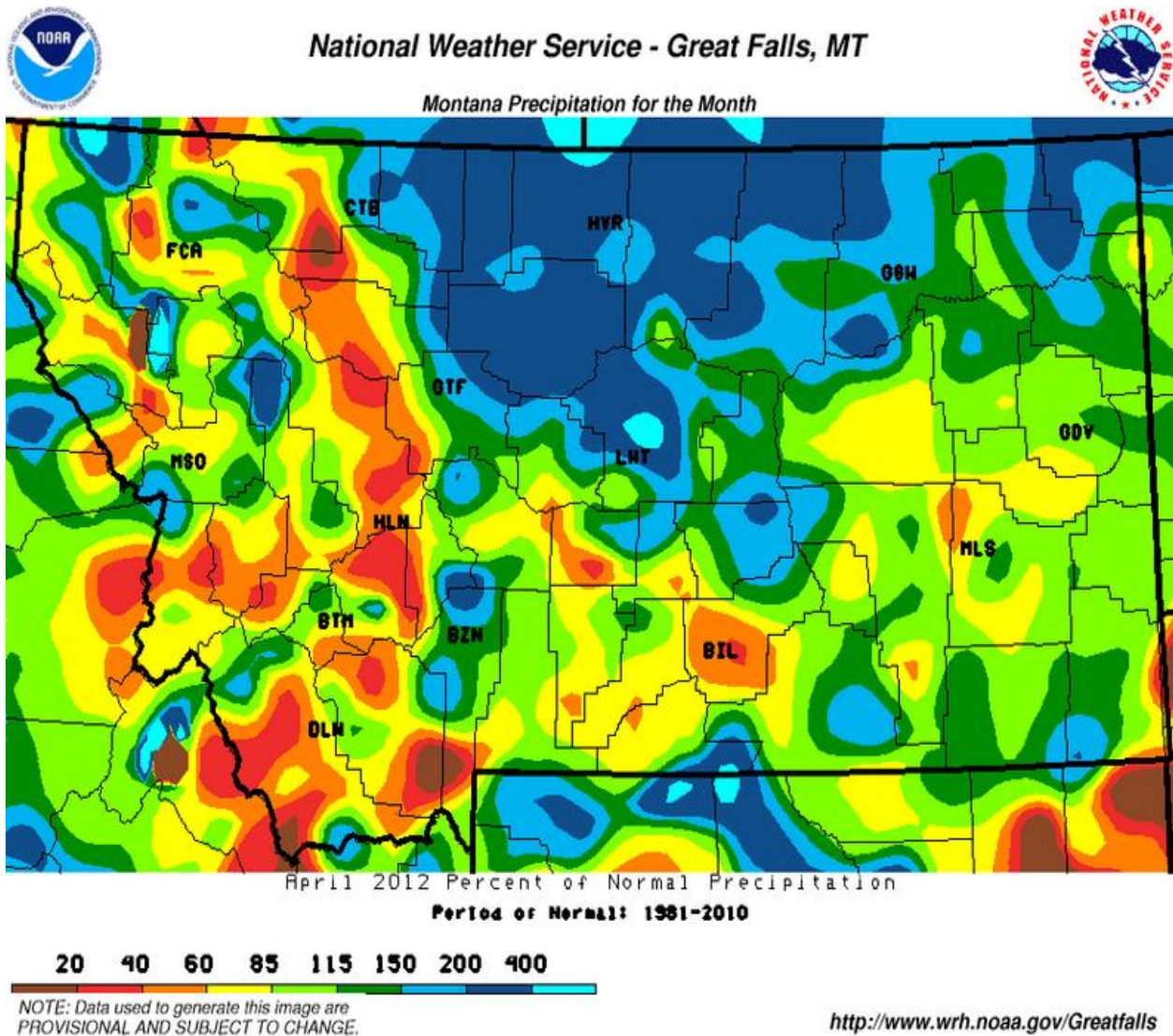


## Precipitation and Temperature

Precipitation through April of the 2012 Water Year (October 1, 2011 through April 30, 2012) has ranged from about 50 to 150 percent of average with some small pockets of well below and well above average. The following maps of over 300 observation locations show precipitation for several time periods.



April 2012 precipitation was near average for Eastern Montana, well above average for Northcentral Montana, near average for mountain and valley elevations west of the Continental Divide, and from around 70 to 150 percent of average for Central Montana with some exceptions.



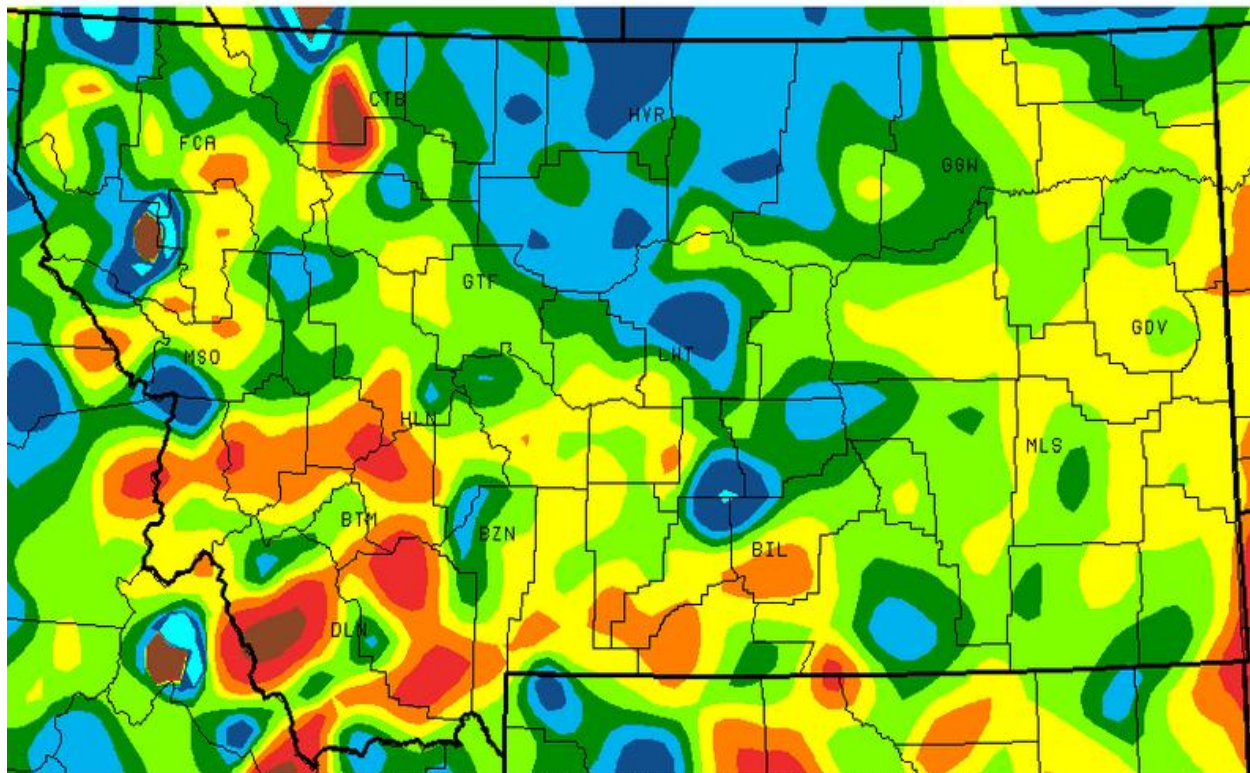
Calendar Year 2012 has brought from 60 to 120 percent of average precipitation to eastern areas of the state, 70 to 150 percent of average to central areas, 80 to 200 percent to northern Montana, and 60 to 200 percent or more for the state west of the Continental Divide.



## National Weather Service - Great Falls, MT



### Montana Precipitation for the Calendar Year



Jan-Apr 2012 Percent of Normal Precipitation

Period of Normal: 1981-2010

20 40 60 85 115 150 200 400

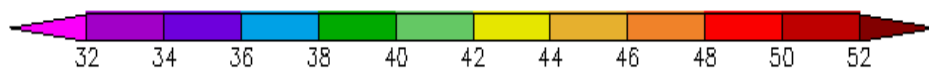
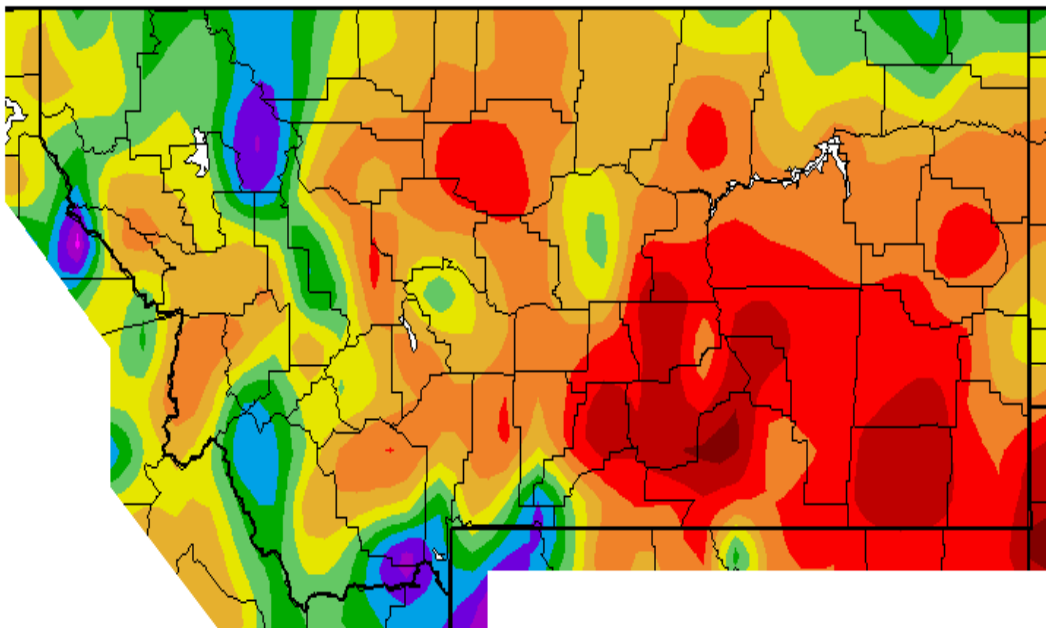
NOTE: Data used to generate this image are  
PROVISIONAL AND SUBJECT TO CHANGE.

<http://www.wrh.noaa.gov/Greatfalls>

The NOAA Western Regional Climate Center generates temperature and precipitation maps daily showing departures from, and percentages of average. [http://www.wrcc.dri.edu/anom/mon\\_anom.html](http://www.wrcc.dri.edu/anom/mon_anom.html)

The average daily temperature over the past six months shows areas of anomalously warm daily average temperatures for large areas of the state over the course of the fall and into a warm and "open" winter. In contrast, cooler than normal temperatures over winter 2010-2011 and into spring preserved some of the heaviest snow coverage on the prairies in years.

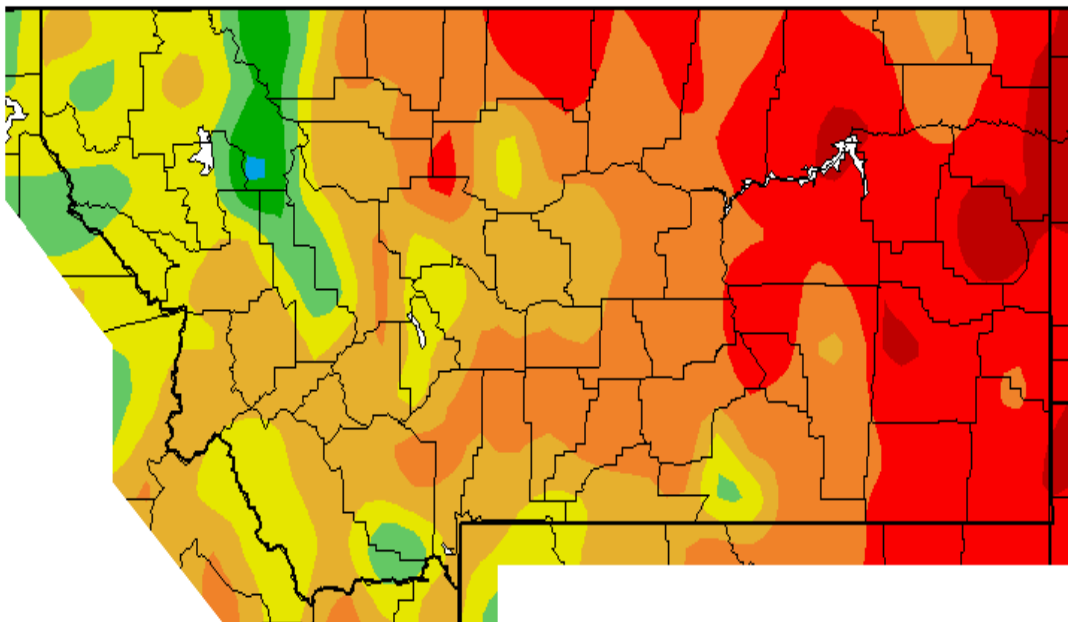
Av. Max. Temperature (deg. F)  
11/10/2011 – 5/9/2012



Generated 5/10/2012 at WRCC using provisional data.  
NOAA Regional Climate Centers

The average daily *maximum* temperature expressed as a departure from average illustrates the anomalously warm daily high temperatures seen in the eastern area of the state over the past 6 months:

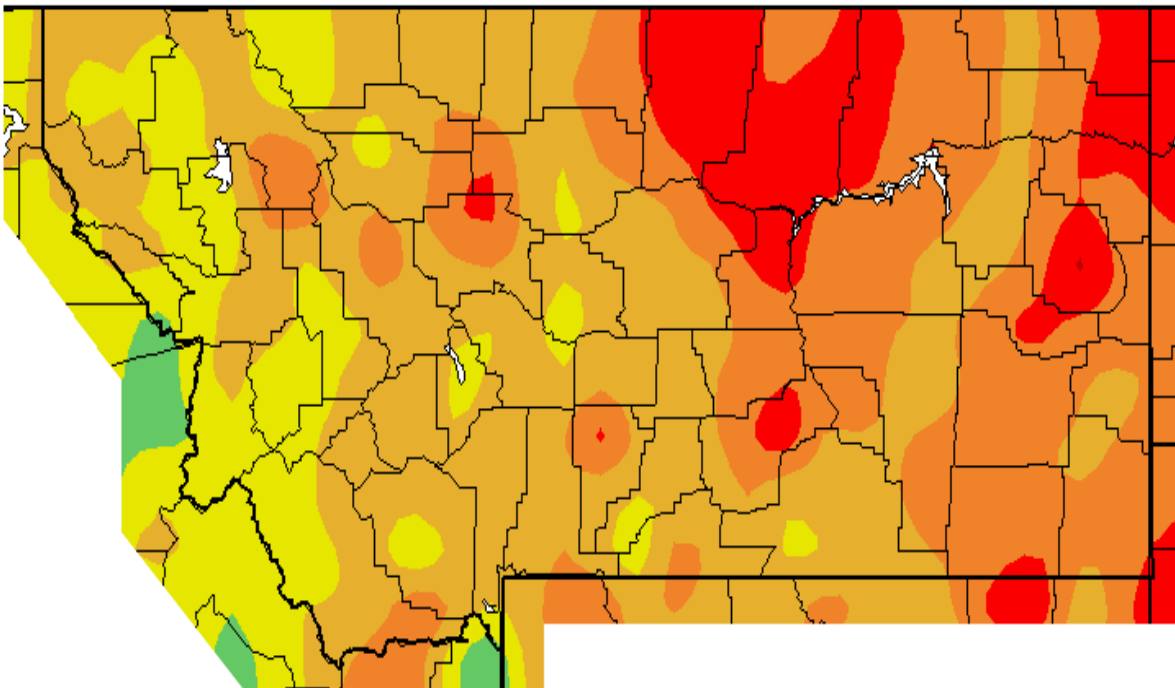
Av. Max. Temperature dep from Ave (deg F)  
11/10/2011 – 5/9/2012



Generated 5/10/2012 at WRCC using provisional data.  
NOAA Regional Climate Centers

The average daily *minimum* temperature expressed as a departure from average illustrates the anomalously high daily low temperatures seen across the state east of the Continental Divide where temperatures from 3 to 8 F degrees above average were common over the past 6 months:

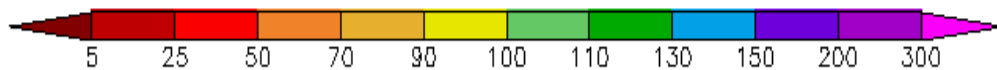
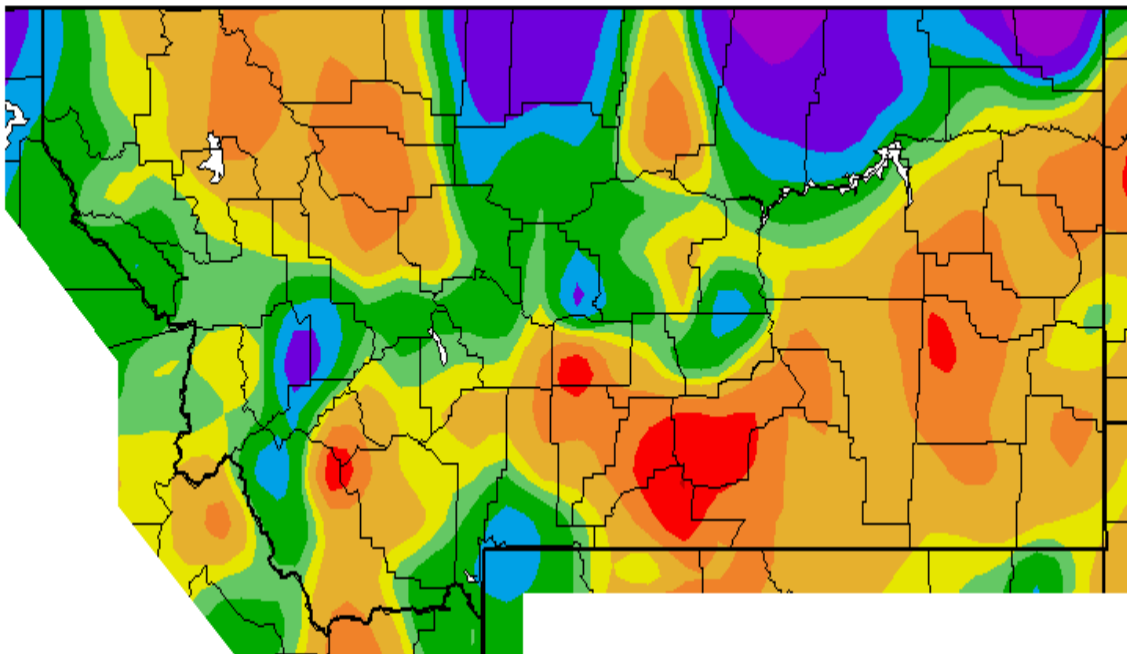
Av. Min. Temperature dep from Ave (deg. F)  
11/10/2011 – 5/9/2012



Generated 5/10/2012 at WRCC using provisional data.  
NOAA Regional Climate Centers

Montana precipitation over the past six months, as a percentage of average, indicates most areas east of the Divide ranged from 40 to 110 percent, with some areas of the Hi-line 100 to 200 percent, while west of the Divide between 70 and 120 percent of average.

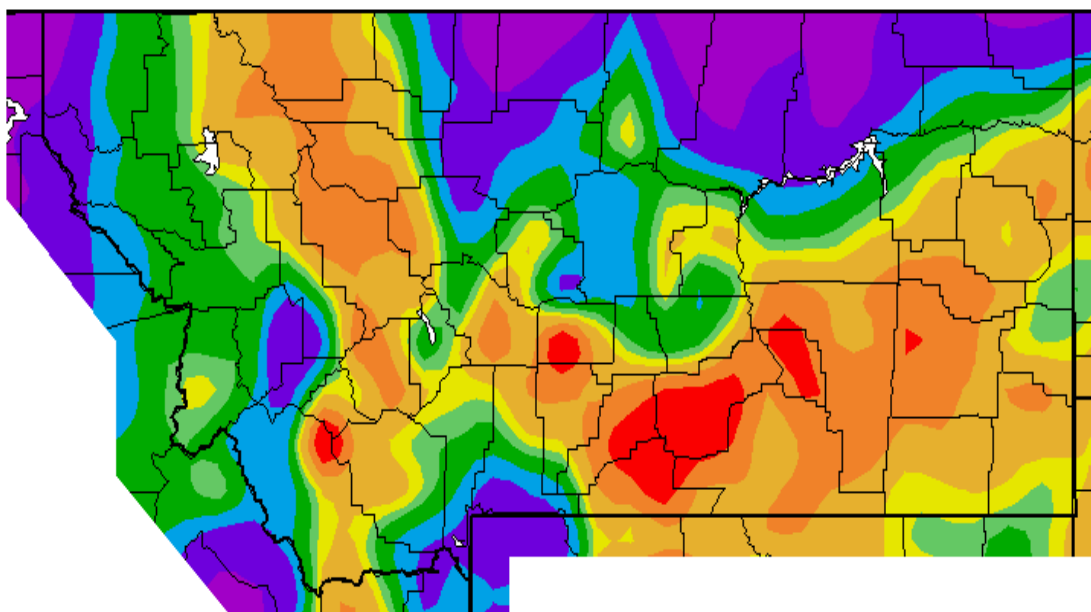
Percent of Average Precipitation (%)  
11/10/2011 – 5/9/2012



Generated 5/10/2012 at WRCC using provisional data.  
NOAA Regional Climate Centers

Precipitation over the past three months indicates that locations in the northwest, southwest, central, and northcentral regions received from between 100 and 250 percent of average, while the southeast and eastern regions received markedly less precipitation, ranging from 20 to 70 percent of average.

### Percent of Average Precipitation (%) 2/10/2012 – 5/9/2012



Generated 5/10/2012 at WRCC using provisional data.  
NOAA Regional Climate Centers

The National Weather Service (NWS) Great Falls State Office prepares a semi-monthly drought report summarizing weather and precipitation for 21 cities and towns for the month and water year. See: [http://www.wrh.noaa.gov/tfx/pdfs/hydro/drought\\_semi.pdf](http://www.wrh.noaa.gov/tfx/pdfs/hydro/drought_semi.pdf) NWS April 2012 report:

*This was the 33rd warmest April, and the sixth consecutive month with above normal temperatures. This was also the warmest April since 1992. Temperature anomalies were greatest over northeastern Montana. For the period October through April, temperatures averaged 34.3F, or 3.4F above normal (the 5th warmest of record) and the warmest of this period since 1999-2000.*

*Precipitation varied widely across the state. Above normal departures were mainly across the north central and northeast portions (Fig. 4). Overall, April averaged 0.17-inches above normal, or 1.50-inches. This was 113% of normal, and the 28th wettest April of record. The mean precipitation excess over the past 12 months is 1.55-inches and the fourth consecutive month to average above normal precipitation statewide. For the period October through April, precipitation averaged 7.05-inches, or 0.68-inches above normal, and the 39th wettest of record.*

*The largest storm of the month occurred from the 27th-29th. Up to six inches of precipitation fell over the Big Snowy Mountains, and 2.5 feet of snow. High amounts also fell over the Bridgers, Highwoods, Little Belts, Bears Paws and Crazy's. Even at lower elevations, 1.5 inches of rain fell at Havre and Lewistown. This storm pushed into eastern Montana with over two inch amounts reported. Soil moisture values rebounded from the dry conditions earlier in the month.*

## **Mountain Precipitation**

According to the NRCS, nearly 80 percent of annual streamflow in Montana originates as snowfall that accumulates high in the mountains during fall, winter, and spring. Aquifers, lakes, streams, and reservoirs are largely dependent on runoff from mountain snowpack. As the snowpack accumulates, hydrologists are able to forecast the runoff that occurs when it melts, and in turn, the streamflow expected in the months that follow. NRCS records for the current period of record, 1971-2000 indicate that the peak of snow water equivalent (SWE) of the snowpack occurs around April 15 each year. See: <http://drought.mt.gov/Committee/Presentations/2012/May/NRCS.pdf>

According to the Natural Resources Conservation Service (NRCS) as of April 18, the water content of the mountain snowpack west of the Continental Divide ranges from 127% in the Kootenai River Basin to 96% in the Upper Clark Fork River Basin. East of the Divide, the mountain snowpack water content ranges from 113% in the St. Mary and Milk River Basins, to 77% of the 30-year period of record 1971-2000 in the Lower Yellowstone River Basin. The La Niña climate event of winter 2011-2012 was a primary factor leading to the normal to high water content of the mountains of the state. The effects of La Niña (or El Nino) on Montana are relatively negligible by late spring. Temperature daily highs and lows will determine at what rate the snowpack runs off.

This year, regular snowfall events continuing throughout March and April increased the water content of the mountain snowpack bringing it to average or above after a dry period during January and February. In recent weeks, warmer than usual temperatures have melted snowpack at low and mid-elevations in the headwaters of the lower Yellowstone River in Wyoming bringing SWE there down into the 75 to 85 percent range from where it was by early March in the 110-130 percent range for water content. Between April 18 and 25, Missouri River basins lost from 12 to 27 percent of SWE against the 1971-2000 period of record while basins on the west side of the state lost between 5- and 15 percent SWE.

The following table summarizes water year mountain precipitation from the NRCS Snotel automated network as of April 18 for the major river basins of the state. The peak of water content of the snowpack is around April 15 for the 1971-2000 period of record. The "Snow Water Equivalent" figures indicate the water content of the snow at the site on that date, whereas the year-to-date or "Total Precipitation" figures show what precipitation has occurred since October 1, 2011 at Snotel sites whether or not it remains (as snow) on the surface of the scale at the site.

**Table 1.**  
**Remaining Water Content of Mountain Snowpack in Montana**  
**and Water Year-to-Date Precipitation <sup>(1)</sup>**

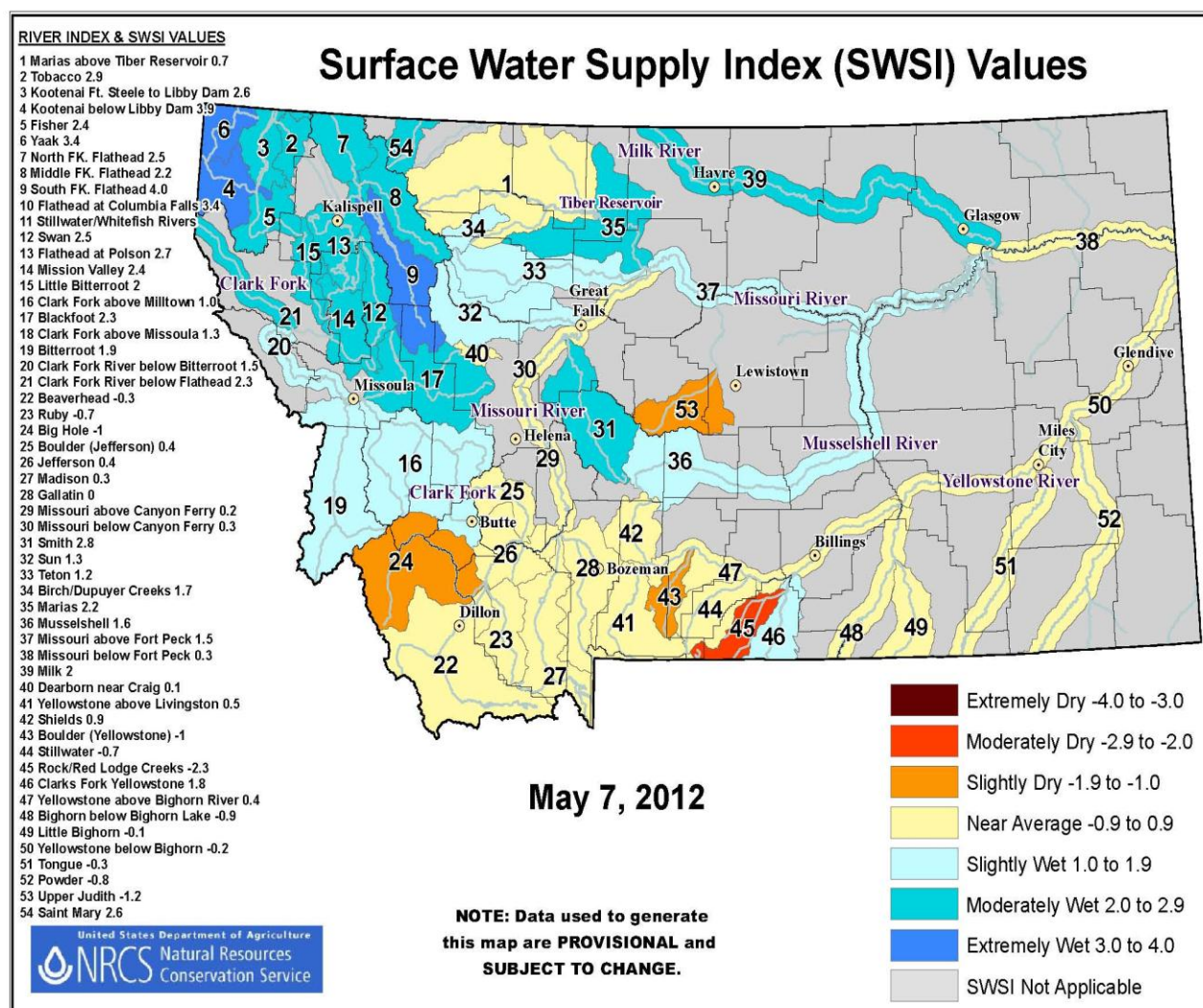
Period of Record 1971-2000

Based on Mountain Data from NRCS SNOTEL Sites  
As of Wednesday, April 18, 2012

<b>Basin</b>	<b>Water Year Snow Water Equivalents (% of average)</b>	<b>Water Year-to-Date Precipitation (% of average)</b>
Kootenai River	128	113
Flathead River	106	107
Upper Clark Fork River	96	102
Bitterroot River	101	104
Lower Clark Fork River	109	105
Jefferson River	85	97
Madison River	93	103
Gallatin River	90	97
Missouri River Headwaters	88	99
Headwaters Missouri Mainstem	108	112
Smith, Judith, & Musselshell	100	110
Sun, Teton, & Marias Rivers	110	103
Missouri Lower	104	107
St. Mary & Milk Rivers	113	112
Upper Yellowstone	87	101
Big Horn	84	107
Tongue River	88	116
Powder	70	106
Lower Yellowstone	77	101

## Surface Water Supply Index

The NRCS generates the Surface Water Supply Index (SWSI) as a projection of surface water availability for 54 Montana river basins based on mountain snowpack, mountain precipitation, streamflow, soil moisture, and reservoir storage. The SWSI is best applied to valley areas with surface water supplies that are dependent primarily upon spring runoff from high elevation mountain snowpack. As of May 7, 2012, the surface water supply outlook for 50 river basins ranged from *Extremely Wet* to *Near Average*. Three other basins were classified as *Slightly Dry* and one *Moderately Dry*. <http://nris.mt.gov/NRCS/swsi/pdf/swsi201205.pdf>  
Link to SWSI map archive: <http://nris.mt.gov/NRCS/swsi/Monthly.asp>



## Reservoir Storage

Reservoir storage statewide is currently very good, in large part due to good carryover storage from water year 2010-2011. As of May 9, 2012 Bureau of Reclamation storage projects ranged generally from 100 to 150 percent of average, the exception being Gibson Reservoir at 45 percent which is expected to fill with the runoff of the snowpack. The May 10 presentation by the Bureau of Reclamation before the Committee can be seen here:

<http://drought.mt.gov/Committee/Presentations/2012/May/USBR.pdf>

Reclamation reservoir storage contents as of May 9, 2012 were as follows:

10-May-12 3:01 PM

BUREAU OF RECLAMATION  
MONTANA AREA OFFICE  
**RESERVOIR OPERATIONS REPORT**  
09-May-2012  
ALL CONTENTS IN ACRE-FEET

RESERVOIR NAME	NORMAL FULL POOL	TOTAL CAPACITY	AVERAGE CAPACITY	RESERVOIR CONDITIONS							WATER SUPPLY OUTLOOK						
				ELEVATION (FEET)		CAPACITY (ACRE-FEET)		2012			MTN. SNOW WATER CONTENT (INCHES)				MAY-JULY RUNOFF MAY 1st FORECAST		
				2011	2012	2011	2012	% FULL	% OF AVG	% OF Last Yr	2011	2012	AVG	% OF AVG	(KAF)	AVG	% OF AVG
CLARK CANYON	5546.10	174,368	161,137	5544.47	5546.08	166,043	174,264	100	108	105	19.33	4.94	12.44	40	29	89	33
CANYON FERRY	3797.00	1,891,888	1,507,588	3778.93	3789.28	1,328,795	1,640,670	87	109	123	23.64	11.78	15.47	76	1,254	1,589	79
GIBSON	4724.00	96,477	61,875	4643.22	4711.20	20,630	80,272	83	130	389	20.10	6.00	8.71	69	362	398	91
PISHKUN	4370.00	46,694	42,110	4363.57	4370.19	37,395	46,984	101	112	126	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
WILLOW CREEK	4142.00	31,848	25,623	4140.35	4140.27	29,466	29,352	92	115	100	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
LAKE ELWELL	2993.00	925,649	726,942	2984.01	2983.72	777,125	772,861	83	106	99	29.02	15.33	16.80	91	378	346	109
SHERBURNE	4788.00	66,147	21,682	4758.09	4770.10	24,908	38,863	59	179	156	40.55	27.65	24.23	114	94	92	102
FRESNO	2575.00	92,880	69,092	2576.33	2575.81	99,590	96,914	104	140	97	N.A.	N.A.	N.A.	N.A.	59	45	131
NELSON	2221.60	78,951	60,381	2220.98	2220.77	76,297	75,413	96	125	99	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
BIGHORN LAKE	3640.00	1,070,029	794,089	3606.81	3615.07	746,004	795,067	74	100	107	18.95	7.73	13.09	59	650	950	68

RESERVOIR NAME	Inflow		Change From A Year Ago		Feet to Fill												
	Current	% of Avg	Elevation	Capacity													
CLARK CANYON	136	45	1.61	8,221	0.02												
CANYON FERRY	5,948	92	10.35	311,875	7.72												
GIBSON	2,157	122	67.98	59,642	12.80												
PISHKUN	796	N.A.	6.62	9,589	-0.19												
WILLOW CREEK	0	N.A.	-0.08	-114	1.73												
LAKE ELWELL	1,101	69	-0.29	-4,264	9.28												
SHERBURNE	362	97	12.01	13,955	17.90												
FRESNO	972	141	-0.52	-2,676	-0.81												
NELSON	385	N.A.	-0.21	-884	0.83												
BIGHORN LAKE	2,627	78	8.26	49,063	24.93												

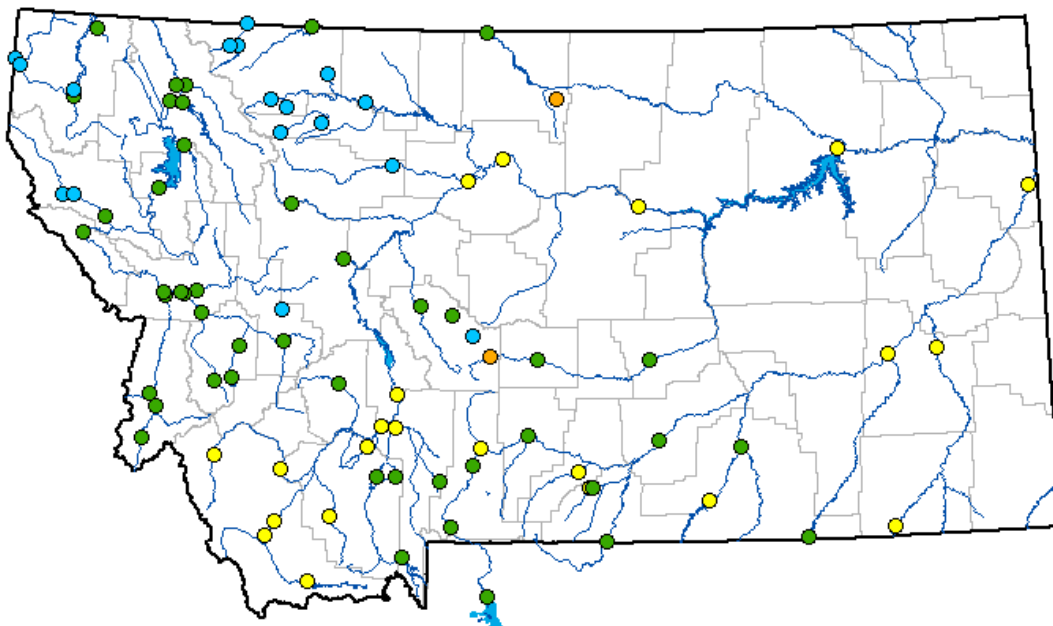
State of Montana owned water storage projects contents as of April 30, 2012 range from about 100 to 150 percent of average. **DNRC's State Water Projects** May 10 presentation before the committee is here: <http://drought.mt.gov/Committee/Presentations/2012/May/DNRC.pdf>

## Streamflow

At the committee's May 10 meeting, the NRCS confirmed that Montanans can expect average surface water supplies for the coming water use season. According to the NRCS, assuming normal precipitation April through July, streamflow statewide, at the 50 percent exceedance level is forecast to be 101 percent of average. West of the Continental Divide flows are forecast to average 109 percent, and east of the Divide, 96 percent of average. On the Columbia, or west side, the Bitterroot is forecast to be 104; the Flathead 111; Kootenai 114; lower Clark Fork 109, and the upper Clark Fork 106 percent of average. In the Missouri River Basin, the flow on the Jefferson River at this time is expected to be about 84 percent through July; the Madison 95; Gallatin 90; Milk 87; St. Mary 119; Sun, Teton, and Marias 119; the upper Yellowstone 93, and the lower Yellowstone 89 percent of average for the period 1971-2000.

<http://drought.mt.gov/Committee/Presentations/2012/May/NRCS.pdf>

USGS May 10 report: <http://drought.mt.gov/Committee/Presentations/2012/May/USGS.pdf>



### STREAMFLOW PROSPECTS

- Extremely Above Average (Over 150)
- Much Above Average (131 - 150)
- Above Average (111 - 130)
- Near Average (91 - 110)
- Below Average (71 - 90)
- Much Below Average (51 - 70)
- Extremely Below Average (Below 51)

According to its April 13, 2012 streamflow and reservoir contents report, the U.S. Geological Survey (USGS), Montana Water Science Center, reported streamflow and reservoir contents continued to be “mostly above normal” for the month of March in Montana. Monthly mean streamflow was below normal at the Marias River near Shelby and at Rock Creek below Horse Creek, near the international boundary.

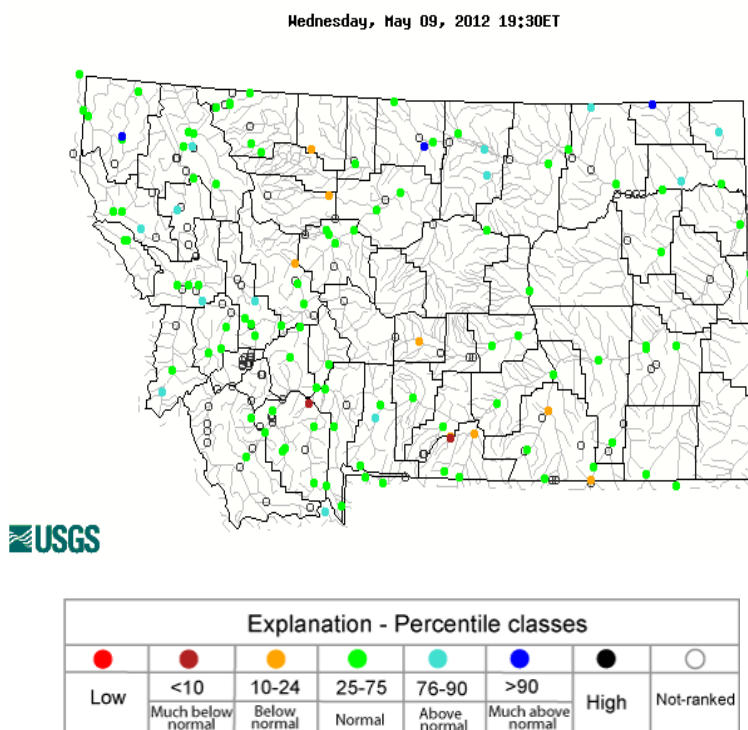
Monthly mean streamflow was normal at:

- Clark Fork at St. Regis
- Yaak River at Troy
- Middle Fork Flathead River near West Glacier
- Yellowstone River at Billings

Monthly mean streamflow was above normal at:

- Blackfoot River near Bonner
- Yellowstone River at Corwin Springs

Contents were normal at four of six major hydroelectric reservoirs in Montana: Canyon Ferry Lake, Fort Peck Lake, Bighorn Lake, and Flathead Lake. Contents were above normal at Lake Koocanusa and Hungry Horse Reservoir. Contents were below normal at one of four major irrigation reservoirs in Montana; Gibson Reservoir, and above normal at three; Lima, Clark Canyon, and Fresno Reservoirs. Supporting [data are available online](http://waterwatch.usgs.gov/?m=real&r=mt) Interactive map of current streamflow conditions for Montana. <http://waterwatch.usgs.gov/?m=real&r=mt> The May 10 presentation: <http://drought.mt.gov/Committee/Presentations/2012/May/USGS.pdf>



Real-time streamflow conditions: <http://waterdata.usgs.gov/mt/nwis/current/?type=flow>

## U.S. Drought Monitor

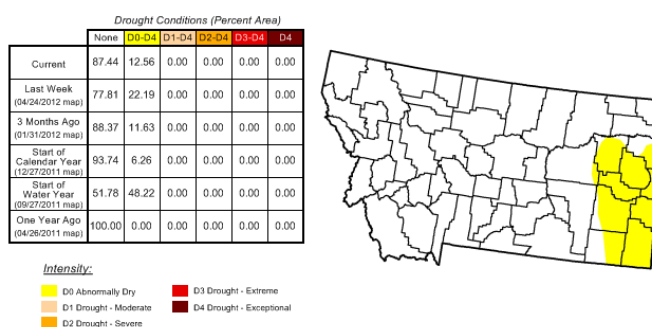
The Drought Monitor map is a widely used cooperative weekly assessment product that describes the degree, type, and extent of drought conditions across the nation. See: <http://drought.unl.edu/dm/monitor.html>

The Drought Monitor ranks the degree of drought from Abnormally Dry (D-0) to Moderate (D-1), Severe (D-2), Extreme (D-3), or Exceptional (D-4). As of May 1, 2012 the U.S. Drought Monitor showed no presence of drought over the entire state.

### U.S. Drought Monitor

May 1, 2012  
Valid 7 a.m. EST

#### Montana



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu>

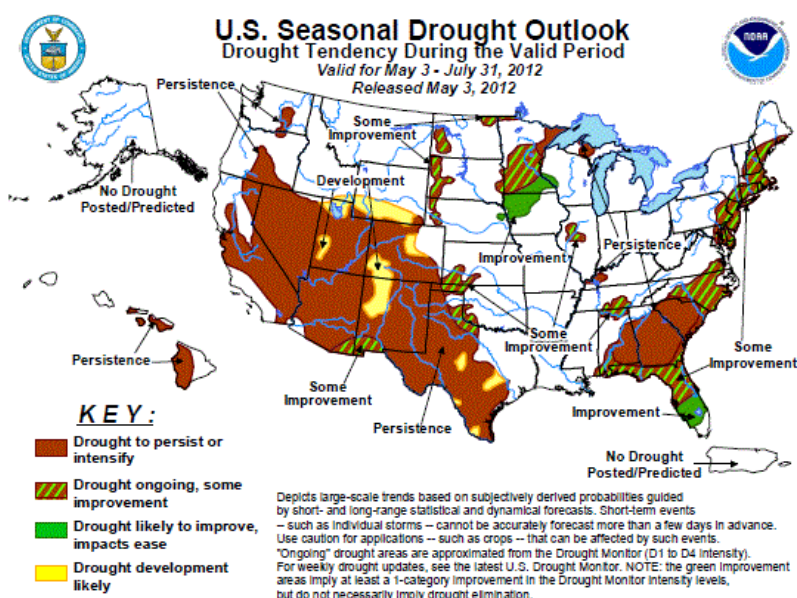


Released Thursday, May 3, 2012

Matthew Rosencrans, Climate Prediction Center/NCEP/NWS/NOAA

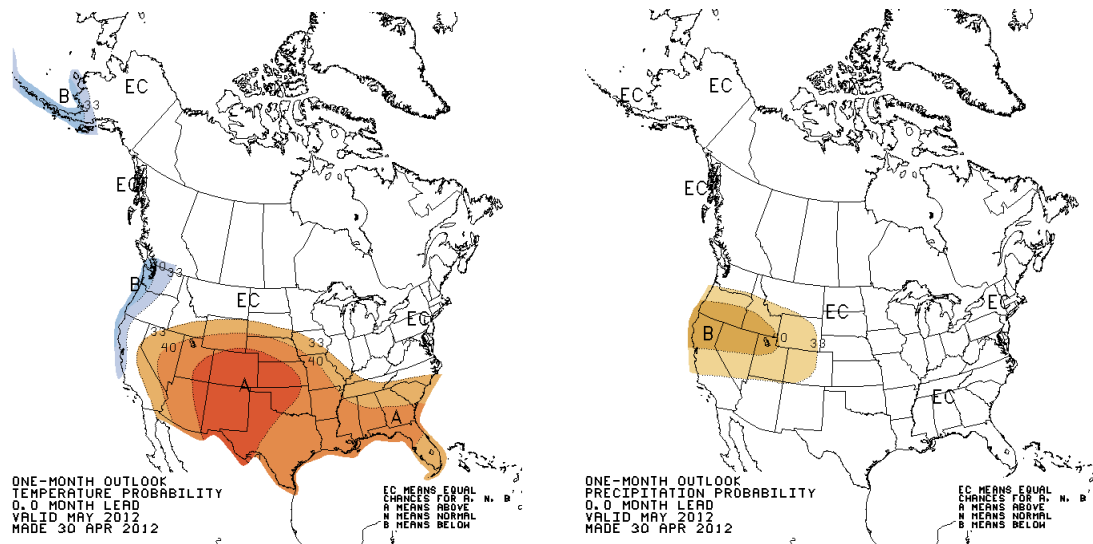
## U.S. Seasonal Drought Outlook

The U.S. Drought Monitor May 3, 2012 seasonal drought outlook for the period of May 3 through July 31, 2012 indicates the potential for drought conditions is unlikely for the state through July.

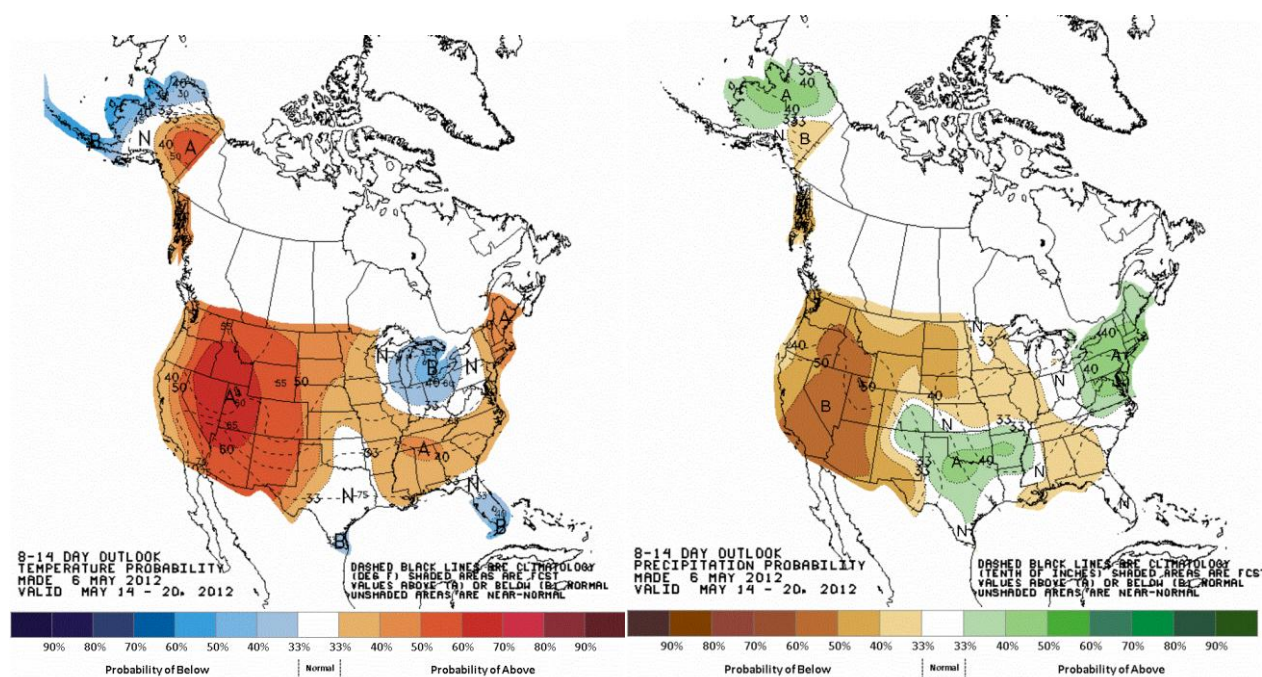


## Climate Forecasts

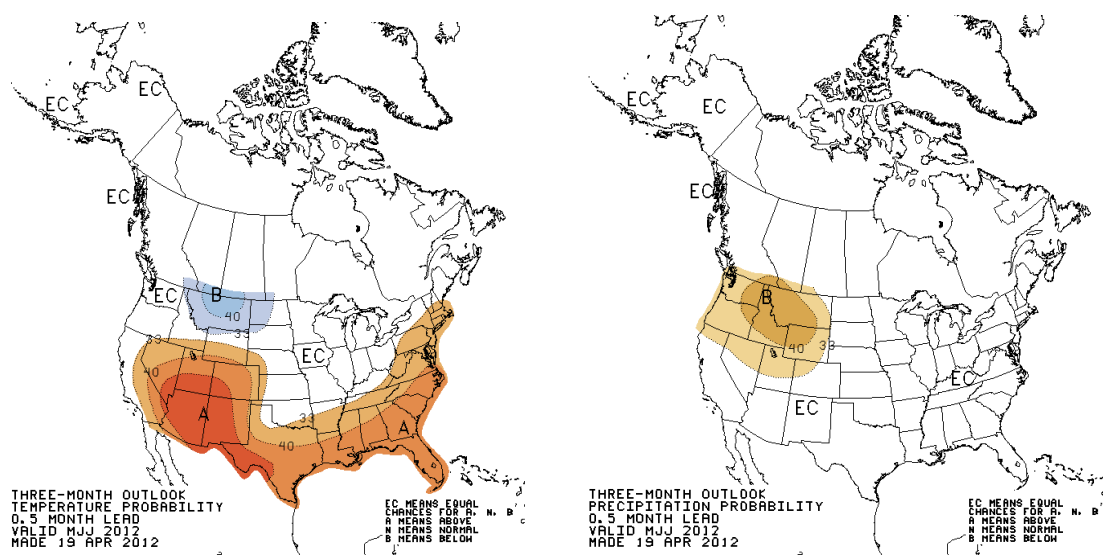
NOAA's Climate Prediction Center (CPC) April 30 one-month climate outlook for the month of May calls for equal chances of above, normal, or below average temperatures statewide and the same for precipitation with the exception of slightly drier than average along the southwest with Idaho.



The May 6 CPC 8- to 14-day Outlook for the period of May 14 to 20, 2012 calls for a 40- to 50-percent chance for temperatures to be above normal with up to a 60-cent chance in the southwest corner and up to a 40-percent chance in the northeast corner area of the state. The outlook calls for precipitation be 40- to 50-percent of normal for most of the state with an area of 33- to 40-percent along the Hi-line counties.



The CPC three-month outlook released April 19 for the period May-June-July 2012 indicates a 40 percent probability of cooler than normal temperatures for much of Montana with a 50-percent chance of cooler than normal temperatures for the northcentral region of the state. For the same period, CPC is calling for below normal precipitation over most of the state with western and central Montana a 40- to 50-percent chance of being drier than normal.



## Crop Weather and Progress Reports

According to USDA's National Agricultural Statistics Service April 30, 2012 Crop Weather Report, "Warm, rainy conditions prevailed for much of Montana last week bringing needed measurable precipitation across most of the state. Neihart received the highest amount of precipitation for the week with 1.58 inches of moisture and most other stations saw 0.06 to 1.57 inches. High temperatures ranged from the upper 70s to 90 degrees, with the state-wide high temperature of 91 degrees recorded at Miles City."

"Winter wheat condition was rated at 55 percent good to excellent showing spring growth with 92 percent greening and growing ahead of last year's 55 percent and the 5 year average of 70 percent due to unseasonably warm temperatures." Barley planted is at 72 percent planted compared to 12 percent last year and the 5 year average of 39 percent. Spring wheat is 68 percent planted, compared just 6 percent last year.

Early spring grazing conditions are 85 percent open, above last year's 74 percent above the 5-year average of 81 percent. Range and pasture feed condition was 41-percent good and excellent and 40-percent fair. The need to provide supplemental feed continues to decrease with warmer weather from last week and is much lower than the previous year. Livestock are moving to summer ranges ahead of last year and the 5-year average. Calving is 87-percent complete above last week at 81 percent and 84 percent last year.

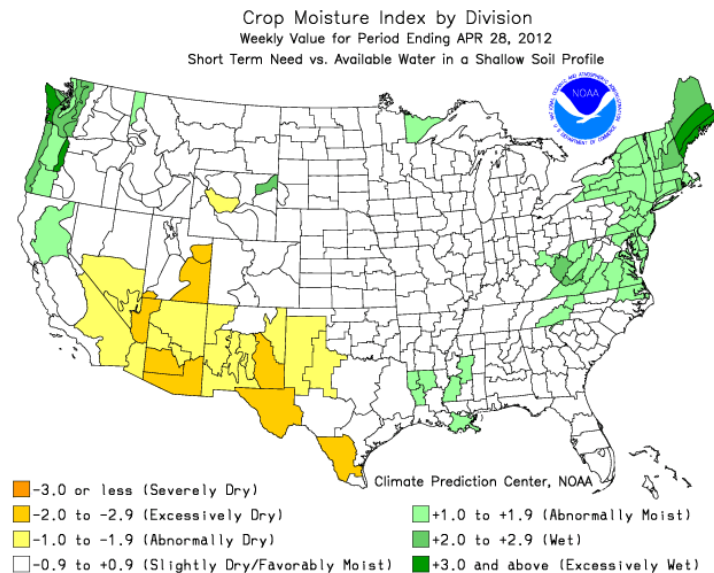
## Soil Moisture

According to USDA's National Agricultural Statistics Service April 30, 2012 Crop Weather Report topsoil moisture adequate to surplus is 77 percent compared with 100 percent last year and the 5-year average of 79 percent. Subsoil moisture was 69 percent adequate and surplus compared to 98 percent last year and the 5-year average of 65 percent. The Agricultural Statistics Service's presentation at the May 10 Drought Advisory Committee meeting can be seen here:

<http://drought.mt.gov/Committee/Presentations/2012/May/NASS.pdf>

The NRCS Soil Climate Analysis Network (SCAN) soil moisture graphs can be seen here:

<http://drought.mt.gov/Committee/Presentations/2012/May/NRCS.pdf>



## Climatology

### El Niño / Southern Oscillation (ENSO)

The positive (El Niño) and negative (La Niña) phases of ENSO have fairly predictable effects upon Montana usually bringing drier and warmer winters during El Niños and wetter and cooler winters during La Ninas. The impacts each phase creates during winter, such as high or low water content of mountain snowpack, have significant influence on water supply and soil moisture for the following crop season. Evidence of ENSO can be found in tree rings and other paleo-proxy sources dating back centuries. Four La Ninas since 2007 have played a significant part in facilitating hydrologic recovery from over six years of drought in Montana from 2000 through 2007. A strong La Niña during winter 2010-2011 was, in part, the cause of record snowfall and flooding in spring 2011 across Montana. The weaker La Niña of winter 2011-2012 peaked in strength by early February but its effects have persisted into late April, boosting water content of mountain snowpack to average or above levels.

According to NOAA's Climate Prediction Center (CPC) May 3, 2012 ENSO Update, calls for ENSO-neutral conditions through July through September followed by equal chances of Neutral or El Nino conditions for the remainder of the year. See:

[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/enso\\_advisory/ensodisc.pdf](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.pdf)

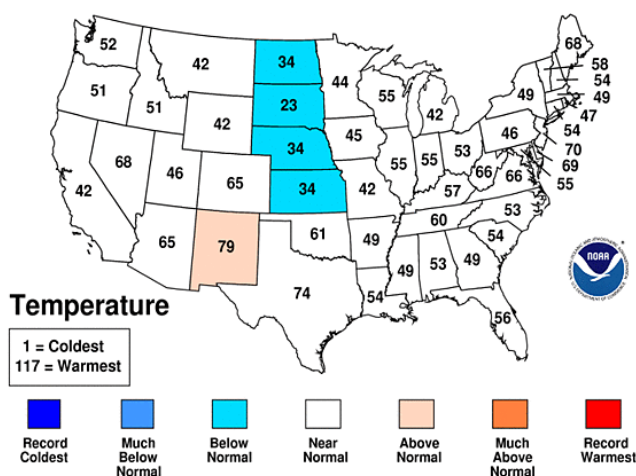
Temperatures over the course of winter 2011-2012 contrasted sharply from those of 2010-2011.

<http://www.climatewatch.noaa.gov/article/2012/u-s-has-fourth-warmest-winter-on-record-west-southeast-drier-than-average> NOAA - Climate Watch Magazine/Rebecca Lindsey, March 13, 2012

Three-month Temperature January-February- March 2010-2011  
Montana had its 42<sup>nd</sup> coldest for the 117-year record 1894-2011.

### January-March 2011 Statewide Ranks

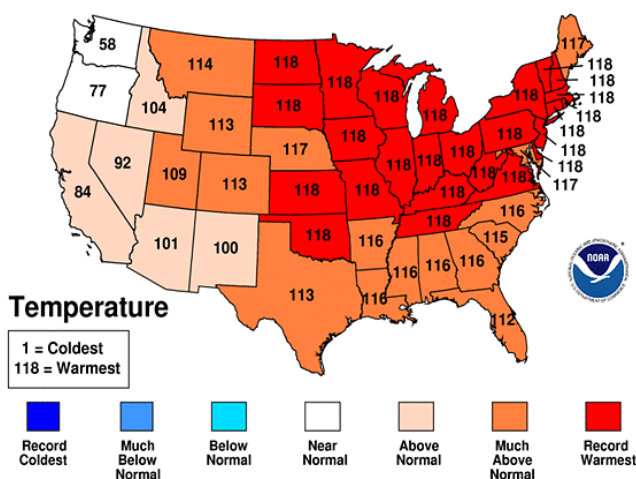
National Climatic Data Center/NESDIS/NOAA



Three-month Temperature January-February-March 2011-2012  
Montana had its 4<sup>th</sup> warmest in 118-year record 1894-2012.

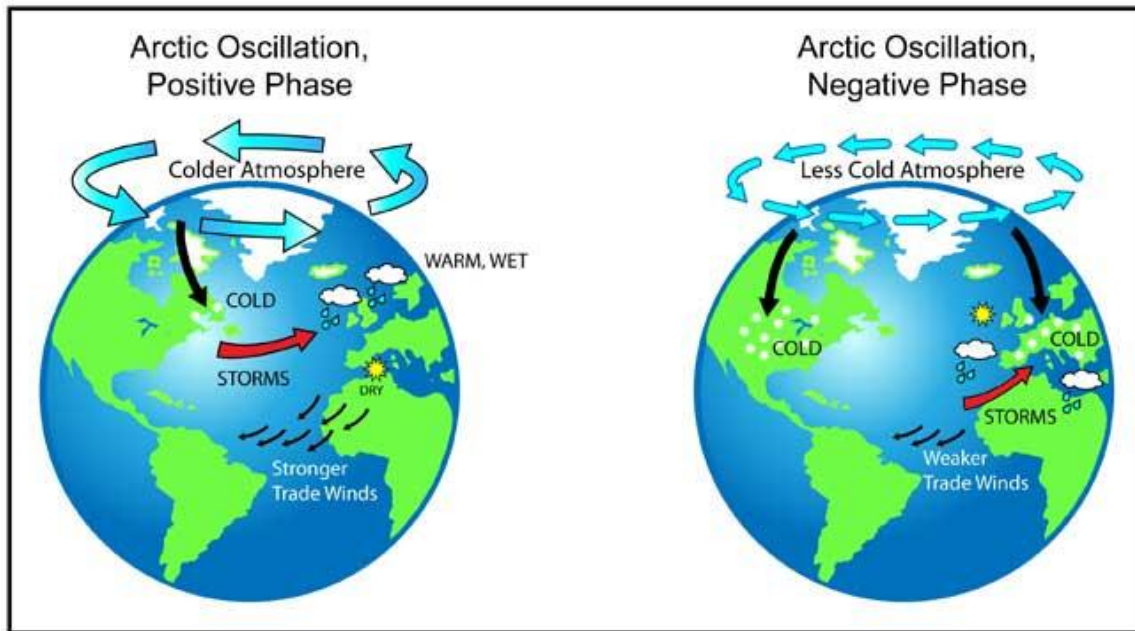
### January-March 2012 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA

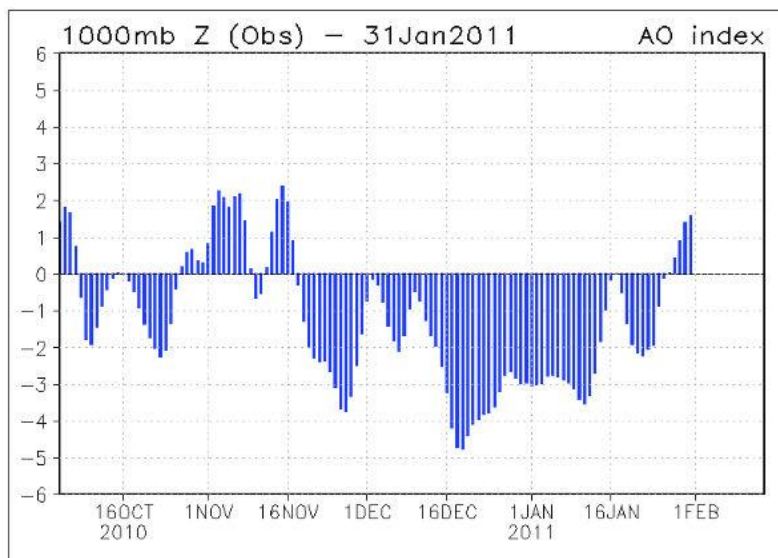


## Arctic Oscillation (AO)

The Arctic Oscillation (AO) is the dominant pattern of non-seasonal sea level pressure (SLP) variations north of 20N Latitude, and it is characterized by SLP anomalies of one sign in the Arctic and anomalies of opposite sign centered about 37–45N Latitude. The AO had significant influence on temperatures and precipitation in the Northern Hemisphere for winters 2010-11 and 2011-12. (NOAA)

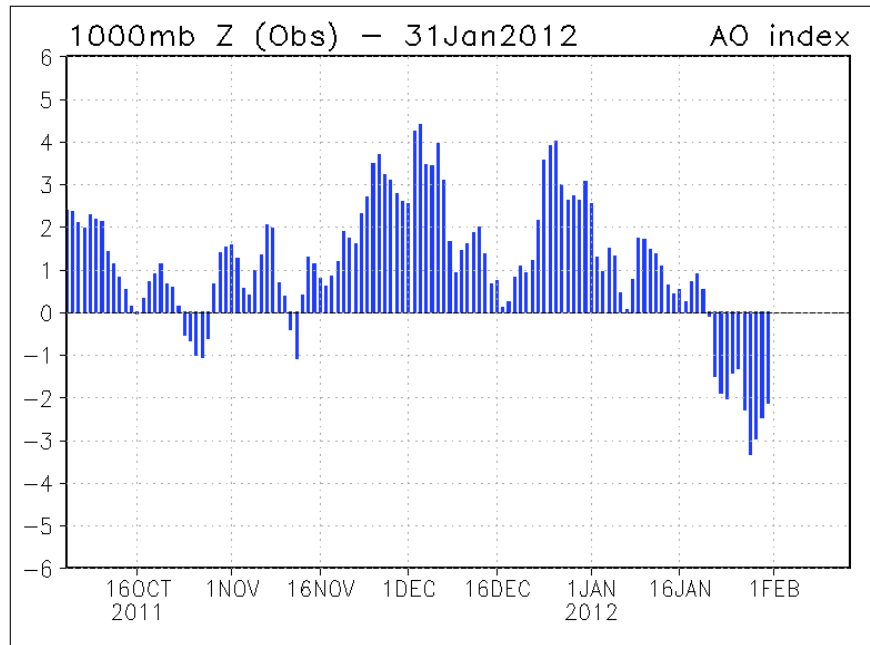


During winter 2010-2011 the AO (index below) was in its negative phase (less than 0) most of the winter with the Arctic under high pressure moving the jet stream south and allowing cold air to plunge south into Montana where it delivered cold temperatures and with moisture present, high snowfall. The state had its 42nd coldest January-March for period of record 1894-2011.



During winter 2011-2012 (index below) the AO was in its positive or warm phase, (with values above 0) most of the winter with low pressure over the Arctic pulling the jet stream north into Canada and blocking cold incursions from reaching south into Montana. This set-up also pulled heat from the southern U.S. north to Montana. As a result Montana had its 4<sup>th</sup> warmest January - March in 118 years of record keeping or since 1895.

See: <http://www.climatewatch.noaa.gov/video/2012/winter-2011-2012-recap>



### Pacific Decadal Oscillation (PDO)

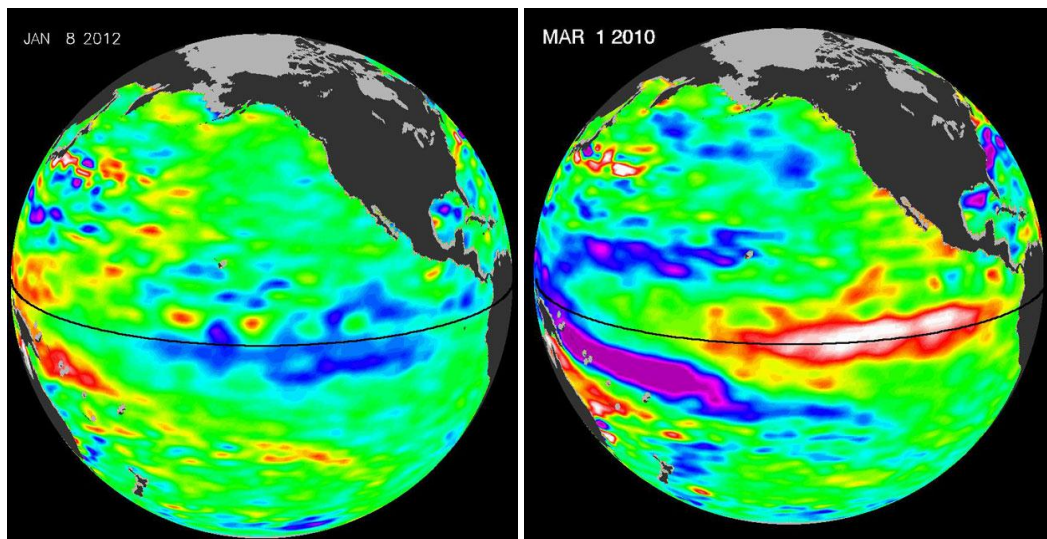
In 1996, Washington state fisheries biologist Steven Hare coined the term Pacific Decadal Oscillation to describe a large circulation pattern that oscillates from cold to warm phases between the north-central and northeastern Pacific Ocean on a time scale of about 20 to 30 years. Climatologists are now able to determine when the phases of the PDO are shifting and continue to discover the extent of its effects upon the climate of North America.

The following image on the left below of the Pacific Ocean from January 18, 2012 generated by the Ocean Surface Topography Mission (OSTM) Jason-2 Satellite, shows the cool equatorial sea surface temperatures (SSTs) characterized by below average sea surface elevation (blues) of the La Nina, and the PDO in its cool phase with SSTs along the North American Coast and north Pacific (green-blue) near normal or below as well.

In contrast, the image on the right below generated March 1, 2010 during the 2009-2010 El Nino, shows the anomalously warm (elevated) equatorial sea surface temperatures (reds-white) and the cool sea surface temperatures SSTs of the northcentral Pacific and along the North American Coast indicating the PDO in its cool phase (green-blues). The PDO returned to its cool phase in 2008 after its 30-year warm from 1977 to 2007.

<http://jisao.washington.edu/pdo/> & <http://www.cbbulletin.com/416164.aspx>

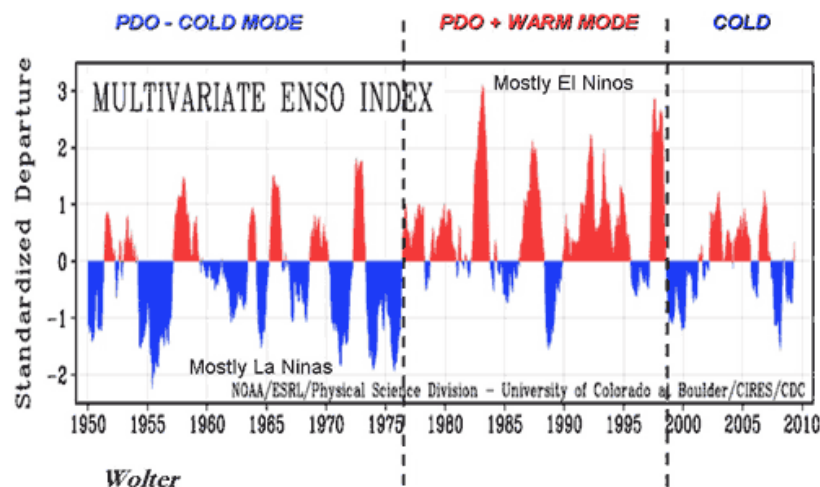
Recent values indicate its negative phase continues: <http://jisao.washington.edu/pdo/PDO.latest>



“NASA Sees Repeating La Nina Hitting its Peak”, (left above) January 18, 2012

[http://sealevel.jpl.nasa.gov/science/elinopdo/el\\_nino/index.cfm?FuseAction=ShowNews&NewsID=389](http://sealevel.jpl.nasa.gov/science/elinopdo/el_nino/index.cfm?FuseAction=ShowNews&NewsID=389)

Researchers believe that for now, the PDO remains in a cold phase which generally, has a positive effect in terms of increased precipitation and cooler temperatures for Montana. See: <http://cse.washington.edu/cig/maps/index.shtml> A user of this tool can enter combinations of the phases of PDO and ENSO to get a probabilistic seasonal climate forecast for Western Montana generated from the period of record 1915-2003.



**Wildfire Season** <http://gacc.nifc.gov/nrcc/index.htm>

According to the Northern Rockies (Wildfire) Coordination Center located at the Missoula Regional Airport, as of May 10 there are no indications for anything other than a normal wildfire season. However, high winds and human ignition have caused some prairie wildfire incidents in the central region in April. The May 1, 2012 DNRC Fire Status Summary indicates 40 fires on 12,170 acres. See: [http://svc.mt.gov/dnrc/f300/ytd\\_summary.aspx?redirected=true](http://svc.mt.gov/dnrc/f300/ytd_summary.aspx?redirected=true)

## **CONCLUSION**

At this time the Montana Governor's Drought Advisory Committee rates the potential for drought-like conditions through mid-July as **low for surface water dependent uses**. The potential for drought to impact **dryland crops across the state at this time is low to moderate** due to a dry late summer and fall of 2011 and well below average precipitation for eastern counties this winter. The April 19, 2012 CPC May-June-July 3-month outlook calls for a 40- to 50-percent chance for drier than normal conditions for the western half of the state and a 40- to 50 percent chance of cooler than normal conditions for the northcentral region of the state. There is a chance that dryland and irrigated crops could be impacted in the eastern counties of the state where Crop Year (April 1 to date) precipitation is below average including Carter, Powder River, Garfield, Fallon, Wibaux, Dawson, Richland, Custer, Roosevelt, Sheridan, Rosebud, and Prairie counties. All May 10 presentations: <http://drought.mt.gov/Committee/Meetings.aspx>

## **RESPONSES TO WATER SUPPLY AND MOISTURE CONDITIONS**

Over the course of winter and early spring, the committee's member agencies have focused on dissemination of information regarding the potential for drought. The committee has maintained a continuous flow of pertinent climate information and forecasted conditions to the public through the committee's Internet web site and the print and visual media. At this time the committee continues to closely monitor and report unfolding conditions and climate forecasts. [www.drought.mt.gov](http://www.drought.mt.gov)

### **Internet Site**

The Montana State Library's Natural Resources Information System (NRIS) continues to provide support to the Drought Advisory Committee for maintaining important parts of its Internet site, including current links to the NRCS Surface Water Supply Index map suite and archives, the U.S. Drought Monitor and its related products, and the Montana Water Supply and Moisture Status Map. See: <http://nriss.mt.gov/wis/SWSInteractive/> and <http://drought.mt.gov>

### **Drought Advisory Committee Meetings**

For 2012, the Committee will next meet May 10 to assess and report conditions heading into the growing season. Future meetings for 2012 are scheduled for June 21, July 19, August 16, September 19, and October 18. April and October meetings are mandated by the statute regardless of conditions at the time. The Committee will continue to monitor, assess, and report conditions closely and issue the Montana Water Supply and Moisture Status Map, by county, on a monthly basis. See: <http://drought.mt.gov/committee/meetings.asp>

## MAP FIGURES

Montana Water Supply and Moisture Status by County  
May 2012

<http://nris.state.mt.us/Drought/status/>

NRCS Montana Surface Water Supply Index May 7, 2012

<http://nris.mt.gov/NRCS/swsi/pdf/swsi201205.pdf>

U.S. Drought Monitor Map May 1, 2012

<http://droughtmonitor.unl.edu/> and [http://droughtmonitor.unl.edu/DM\\_state.htm?MT,W](http://droughtmonitor.unl.edu/DM_state.htm?MT,W)

U.S. Seasonal Drought Outlook Map (CPC) May 3, 2012

[http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/seasonal\\_drought.html](http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html)

Palmer Drought Severity Index – April 21, 2012

[http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/regional\\_monitoring/palmer.gif](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif)

Montana Precipitation – Water Year Oct 1, 2011 through April 30, 2012

[http://www.wrh.noaa.gov/tfx/image.php?wfo=tfx&type=data2&loc=hydro&path=hydro&fx=watyr\\_pc\\_ntnorm.png](http://www.wrh.noaa.gov/tfx/image.php?wfo=tfx&type=data2&loc=hydro&path=hydro&fx=watyr_pc_ntnorm.png)

Montana Precipitation – Calendar Year Jan through April 2012

[http://www.wrh.noaa.gov/tfx/image.php?wfo=tfx&type=data2&loc=hydro&path=hydro&fx=calyr\\_pc\\_ntnorm.png](http://www.wrh.noaa.gov/tfx/image.php?wfo=tfx&type=data2&loc=hydro&path=hydro&fx=calyr_pc_ntnorm.png)

Montana Monthly Precipitation – April 2012

<http://www.wrh.noaa.gov/tfx/dbgraphs.php?wfo=tfx&loc=monthly&fx=aprpcntnorm.png>

End

